

AP20 Rec'd PCT/GB 21 JUL 2006

1     Dispensing Apparatus and Method

2

3     This invention relates to a dispensing apparatus and  
4     method, and particularly, but not exclusively, to a  
5     dispensing apparatus and method for dispensing  
6     flowable dentifrice materials onto a toothbrush  
7     head.

8

9     Conventionally, the task of cleaning teeth with a  
10    flowable dentifrice material such as a paste or gel  
11    involves the manual squeezing of a deformable tube  
12    to deposit the material onto a toothbrush.

13    Alternatively, rigid tubes having a manually  
14    operated pump mechanism for dispensing the  
15    dentifrice material are also widely available.

16

17    Other known dispensers employ lever and ratchet  
18    mechanisms, cantilever arm devices or operate  
19    utilising the force of gravity and a winder key  
20    dispensing device.

21

1     Whilst such devices have provided an improved  
2     dispensing means for dentifrice material for the  
3     majority of people, others may find such devices  
4     cumbersome or awkward to use. For example, young  
5     children may have a tendency to over-squeeze a  
6     toothpaste tube and have difficulty in accurately  
7     directing the discharged dentifrice material onto  
8     the toothbrush. The elderly, the infirm and people  
9     suffering from arthritic or related inflammatory  
10    complaints may also find the task of manually  
11    dispensing a dentifrice material onto a toothbrush  
12    rather onerous and/or painful.

13  
14    A further disadvantage of known dispensers, for  
15    dentifrice and other flowable materials, is that it  
16    is often difficult to empty their contents  
17    completely. Consequently, a significant amount of  
18    wastage is typical. Moreover, known dispensers do  
19    not expel dentifrice material in a clean fashion as  
20    it tends to accumulate around their openings.

21  
22    According to a first aspect of the present invention  
23    there is provided a dispensing apparatus comprising  
24    an inlet port for coupling to an opening of a  
25    container containing flowable material and an outlet  
26    port through which the material is dispensed; the  
27    inlet and outlet ports being separated by a conduit;  
28    a first one-way valve positioned at the inlet port  
29    to permit passage of the flowable material from the  
30    container into the conduit, and a second one-way  
31    valve positioned at the outlet port to permit  
32    passage of the flowable material from the conduit;  
33    and means for selectively varying the volume of the

1 conduit between the inlet and outlet ports to pump  
2 the flowable material.

3  
4 Preferably, the conduit is resiliently deformable.

5  
6 Preferably, the respective inlet and outlet ends of  
7 the conduit are displaceable relative to each other  
8 to selectively vary the volume of the conduit  
9 between the inlet and outlet ports.

10  
11 Preferably, the inlet port is adapted to form a  
12 hermetically sealed connection with the opening of  
13 the container.

14  
15 Preferably, a collar for receiving the opening of  
16 the container and forming a hermetic seal is mounted  
17 on, and surrounds, the inlet port.

18  
19 Preferably, the collar is resiliently deformable.

20  
21 Preferably, the collar is annular in shape and has a  
22 substantially planar upper end surface, a  
23 substantially planar lower end surface and  
24 substantially cylindrical internal and external  
25 surfaces.

26  
27 Preferably, at least part of the internal surface of  
28 the resilient collar tapers inwardly from the upper  
29 end surface around its entire circumference to form  
30 a frusto-conical profile.

31  
32 Optionally, at least one upstanding annular sealing  
33 ring extends from the upper end surface.

1  
2 Preferably, the or each upstanding annular sealing  
3 ring is formed integrally with the resilient collar.

4  
5 Preferably, the resilient collar is made from a  
6 silicone material.

7  
8 Preferably, a substantially rigid housing surrounds  
9 the collar and the inlet port.

10  
11 Preferably, a radial flange portion projects  
12 inwardly from the lower peripheral edge of the  
13 housing.

14  
15 Preferably, the inlet end of the conduit proximate  
16 the inlet port is supported on the radial flange.

17  
18 Preferably, the inlet port is interposed between the  
19 conduit and the collar.

20  
21 Preferably, projections are provided on the exterior  
22 of the housing, said projections being releasably  
23 connectable to a wall-mountable casing such that the  
24 dispensing apparatus and the container are locatable  
25 within said casing.

26  
27 Preferably, a cradle member is pivotably and  
28 releasably mounted on the casing.

29  
30 Preferably, cam surfaces are provided on the cradle  
31 member.

32  
33 Preferably, cam surface engaging portions are

1 provided on the outlet port.

2

3 Preferably, the cam surface engaging portions are  
4 diametrically opposed projecting pins.

5

6 Preferably, the cradle member has two sidewalls and  
7 a supporting surface adapted to receive a toothbrush  
8 head.

9

10 Preferably, the supporting surface is provided with  
11 a push surface for selective engagement with the  
12 distal end of the toothbrush head.

13

14 Preferably, the flowable material is semi-solid.

15

16 Preferably, the flowable semi-solid material is  
17 dentifrice material.

18

19 Optionally, the conduit is a bellows pump.

20

21 Preferably, the inlet port is perforated.

22

23 Preferably, the first one-way valve is an umbrella  
24 valve.

25

26 Preferably, the second one-way valve is a duckbill  
27 valve.

28

29 According to a second aspect of the present  
30 invention there is provided a method of dispensing  
31 flowable material from a container using the  
32 dispensing apparatus of the first aspect comprising  
33 the steps of:

1           (i) coupling the opening of a container with an  
2           inlet port of the dispensing apparatus;  
3           (ii) priming the dispensing apparatus to remove  
4           any air within the apparatus or the container  
5           by sequentially reducing and increasing the  
6           volume between the inlet port and an outlet  
7           port in a pumping action; and  
8           (iii) reducing the volume between the inlet and  
9           outlet ports to pump the dentifrice material  
10          from the container and through a first one-way  
11          valve, a conduit and a second one-way valve  
12          respectively.

13  
14        Preferably, the step of reducing the volume between  
15        the inlet and outlet ports is achieved by applying a  
16        force to compress the conduit longitudinally.

17  
18        Preferably, the step of applying a longitudinal  
19        force is achieved by pivoting a cradle member having  
20        cam surfaces about a pivot axis, said cam surfaces  
21        moving cam surface engaging portions provided on the  
22        outlet port, thus moving the outlet port towards the  
23        inlet port.

24  
25        Preferably, the step of pivoting the cradle member  
26        is achieved by placing a toothbrush head on the  
27        cradle member and applying a force in a direction  
28        corresponding to the longitudinal axis of the  
29        toothbrush.

30  
31        Embodiments of the present invention will now be  
32        described, by way of example only, with reference to  
33        the accompanying drawings, in which:

1  
2        Fig. 1 is a cross-sectional perspective view of  
3        the collar and conduit portions of the  
4        dispensing apparatus;  
5  
6        Fig. 2 is a perspective view of the dispensing  
7        apparatus of Fig. 1 and a cradle member, each  
8        located within a wall mountable casing;  
9  
10       Fig. 3 shows both a cross-sectional and plan  
11       view of an alternative collar;  
12  
13       Figs. 4a and 4b are side and cross-sectional  
14       side views respectively of dispensing apparatus  
15       including the collar of Fig. 1 and show valves  
16       and an alternative conduit;  
17  
18       Figs. 5a-c are cross-sectional schematic views  
19       showing the conduit and valves of the  
20       dispensing apparatus at various stages during  
21       its operation; and  
22  
23       Figs. 6a-c are a cross-sectional side view, a  
24       front view and a perspective view respectively  
25       of the complete dispensing apparatus within its  
26       wall mountable casing.  
27  
28       Fig. 1 shows a dispensing apparatus sub-assembly  
29       comprising an inlet port 10 and an outlet port 12  
30       separated by a resiliently deformable conduit in the  
31       form of a bellows pump 14. An upstanding  
32       resiliently deformable collar 16 made from elastic  
33       silicone material is mounted on and surrounds the

1 inlet port 10.

2

3 The collar 16 is annular in shape and has  
4 substantially planar upper and lower end surfaces  
5 16a and 16b, and substantially cylindrical internal  
6 16c and external surfaces respectively. The  
7 transition surface 16d between the first end surface  
8 16a and the internal surface 16c tapers inwardly  
9 around the circumference of the collar 16 to form a  
10 frusto-conical profile.

11

12 A substantially rigid housing 18 surrounds the  
13 resilient collar 16 and is provided with an inwardly  
14 projecting annular flange 20 around the periphery of  
15 its lower edge. The end of the bellows pump 14  
16 proximate the inlet port 10 is supported on the  
17 flange 20 within the housing 18 and the inlet port  
18 10 is held interposed between the end of the bellows  
19 pump 14 and the lower end surface 16b of the  
20 resilient collar 16. The resilient collar 16, the  
21 inlet port 10 and the end of the bellows pump 14 are  
22 fixed firmly at their respective joins by any  
23 suitable means for producing a hermetic seal, for  
24 example, by gluing or hot melt sealing.

25

26 Fig. 3 shows a modified collar 16 having a pair of  
27 upstanding annular sealing rings extending from its  
28 upper end surface 16a. The sealing rings are formed  
29 integrally with the collar 16 and extend  
30 concentrically around the full circumference of its  
31 upper end surface 16a. The height of the inner  
32 sealing ring is less than the height of the outer  
33 sealing ring.



1  
2 In addition, the modified collar 16 of Fig. 3 is  
3 provided with a stepped internal surface with three  
4 different internal diameters. The diameter of the  
5 cylindrical internal surface proximate the upper end  
6 surface 16a is reduced as compared to that of the  
7 central recessed portion of the collar 16. Finally,  
8 the diameter of the cylindrical internal surface  
9 proximate the lower end surface 16b is yet greater  
10 again.

11  
12 As will become apparent, the presence of: (i) the  
13 pair of upstanding annular sealing rings; and (ii)  
14 the reduced diameter portion of the internal surface  
15 proximate the upper end surface 16a, each act to  
16 minimise the possibility of air being sucked into  
17 the dispensing apparatus between the collar 16 and a  
18 container received therein.

19  
20 Figs. 4a and 4b show a further alternative  
21 embodiment of the dispensing apparatus sub-assembly  
22 wherein the conduit 14 has generally cylindrical  
23 sidewalls as opposed to concertina shaped walls.  
24 The lower portion (proximate the outlet valve 24) of  
25 the walls of the conduit 14 shown in Fig. 4b are  
26 thicker than those of the upper portion of the  
27 conduit 14. The thicker walls of the lower portion  
28 cause the internal diameter of the conduit 14 to be  
29 reduced proximate the outlet valve 24.

30  
31 Perforations 21 are provided in the inlet port 10  
32 and an umbrella valve 22 selectively opens and  
33 closes to allow material to pass through the

1 perforations 21 into the bellows pump 14. The  
2 umbrella valve 22 fits within a recessed portion 17  
3 formed at the lower edge of the internal surface 16c  
4 of the collar 16. A duckbill valve 24 positioned  
5 within the outlet port 12 selectively opens and  
6 closes to allow flowable material to pass through  
7 and exit the bellows pump 14.

8  
9 The selection of appropriate one-way valves at the  
10 inlet and outlet ports 10, 12 is important for  
11 effective operation of the dispensing apparatus.  
12 For example, the configuration of the umbrella valve  
13 22 is such that it is appropriate for the suction of  
14 material into the conduit 14 whilst its profile is  
15 such that the valve itself does not substantially  
16 extend vertically into the conduit 14 (for example,  
17 see Fig. 5c). The duckbill valve 24 is particularly  
18 suitable for use at the outlet port 12 because it  
19 provides a directed and even flow of material with a  
20 clean cut-off thus eliminating or reducing any messy  
21 accumulation of dentifrice material thereon.

22  
23 As shown in Fig. 2, the sub-assembly of Fig. 1 is  
24 located within a wall mountable casing 26, which is  
25 fixable onto, say, a bathroom wall 28. Projections  
26 30 are provided on the exterior surface of the  
27 housing 18 and releasably receivable within  
28 corresponding grooves 32 on sidewalls of the casing  
29 26. It will be appreciated that this arrangement  
30 facilitates removal of the sub-assembly from the  
31 casing for cleaning or replacement of parts.

32

1 A cradle member 34 is releasably and pivotably  
2 mounted on the casing 26 by means of protrusions 36  
3 formed on its sidewalls 38, which locate in  
4 corresponding apertures in the casing 26. The  
5 cradle member 34 has cam surfaces 40 formed on the  
6 periphery of each sidewall 38, which engage with  
7 diametrically opposed outwardly projecting pins 42  
8 on the outlet port 12. The cradle member 34 is  
9 provided with a substantially horizontal supporting  
10 surface 46, which joins the lower edges of the  
11 sidewalls 38 of the cradle member 34. The  
12 supporting surface 46 is provided with a push  
13 surface 48 for cooperation with the distal end of a  
14 toothbrush head 44, as described below.

15  
16 As shown in Figs. 6a-c, for aesthetic purposes, the  
17 sub-assembly, cradle member 34 and casing 26  
18 described above are covered by a cover member 50.  
19 The cover member 50 is substantially tubular in  
20 shape and may be formed from any suitable material,  
21 for example, plastics, ceramics, coated metals etc.  
22 The bottom end of the cover member 50 is open-ended  
23 to enable the cover member 50 to slide over the  
24 assembled apparatus described above. The top end of  
25 the cover member is closed. A slit (not shown) may  
26 be provided in the cover member 50 to enable it to  
27 slide over wall-fixings 52 connecting the casing 26  
28 to a wall. An opening 54 is provided at the lower  
29 end of the casing and is positioned to correspond  
30 with the supporting surface 46 of the cradle member  
31 34.

32

1 In use, the opening of a container is located within  
2 the resilient collar 16 and the elastic nature of  
3 the silicone material forms a hermetic seal. The  
4 frusto-conical portion 16d of the collar 16  
5 facilitates coupling of the opening of the container  
6 with the inlet port 10. Optionally, the modified  
7 collar of Fig. 3 may be employed to assist in  
8 providing the hermetic seal.

9  
10 The following description uses the example of  
11 dispensing dentifrice material (i.e. a semi-solid  
12 flowable material) from a deformable toothpaste  
13 tube. It should be appreciated however that the  
14 invention may be used to dispense any other flowable  
15 material, nor is its operation limited for use with  
16 only deformable containers.

17  
18 In order to dispense dentifrice material from the  
19 dispensing apparatus, the dispensing apparatus must  
20 first be primed to remove any air from within the  
21 conduit 14 and the toothpaste container. This is  
22 achieved by positioning the toothbrush head 44 on  
23 the supporting surface 46 of the cradle member 34  
24 and applying a force in a direction corresponding to  
25 the longitudinal axis of the toothbrush. Such a  
26 force causes the toothbrush head 44 to push against  
27 the push surface 48 and pivot the cradle member 34  
28 relative to the casing 26 about its protrusions 36.

29  
30 The pivoting action of the cradle member 34 causes  
31 the projecting pins 42 on the outlet port 12 to  
32 slide up the cam surfaces 40 on the cradle member  
33 34. The pivoting of the cradle member 34 therefore

1 causes the outlet port 12 to be forced upwardly  
2 towards the inlet port 10. During this upward  
3 motion, the bellows pump 14 is compressed  
4 longitudinally and progressively collapses to  
5 thereby reduce the volume between the inlet and  
6 outlet ports 10, 12 and expel air from the bellows  
7 pump 14 and the toothpaste container via the  
8 duckbill valve 24.

9  
10 Upon withdrawal of the toothbrush head 44 from the  
11 push surface 48, the cradle member 34 returns to its  
12 initial position by virtue of the resilient nature  
13 of the bellows pump 14. It may be necessary to  
14 repeat this sequence several times to ensure that  
15 substantially all air is expelled from the bellows  
16 pump 14 and the toothpaste container.

17  
18 Once fully primed, any air in the bellows pump 14  
19 will be replaced with dentifrice material as  
20 indicated in Fig. 5a and the dispensing apparatus is  
21 ready for use. Further pivotal movement of the  
22 cradle member 34 as described above will cause  
23 dentifrice material to be forced from the bellows  
24 pump 14 onto the underlying toothbrush head 44 as  
25 indicated in Fig. 5b. The pivot point 36 of the  
26 cradle member 34 is positioned forward of the  
27 duckbill valve 24 and consequently the toothbrush  
28 travels upwards during the pivoting motion. Such a  
29 motion causes the toothbrush head to 'follow' the  
30 duckbill valve upwards and aids accurate placement  
31 of the dentifrice material onto the toothbrush head  
32 44.

33

1 It will be appreciated that the alternative conduit  
2 shown in Figs. 4a and 4b will operate in a similar  
3 fashion to the bellows pump described above. As  
4 shown in Fig. 4b, the region where the wall of  
5 increased thickness meets the wall of lesser  
6 thickness will deform as the upward force is  
7 applied. It will also be appreciated that the  
8 narrowing of the internal diameter proximate the  
9 outlet valve 24 in Fig. 4b, and hence the reduced  
10 volume of the conduit at this region, will cause a  
11 higher pressure to be imparted to the dentifrice  
12 material as it is expelled from the valve 24.

13

14 Upon removal of the toothbrush head 44 from the  
15 cradle member 34, the resilient nature of the  
16 bellows pump 14 returns the apparatus to its  
17 original position. As illustrated in Fig. 5c,  
18 during the return motion, further dentifrice  
19 material is drawn into the bellows pump 14 through  
20 the open umbrella valve 22 due to the pressure  
21 differential between the inside of the toothpaste  
22 container and the inside of the bellows pump.

23

24 The push stop 48 on the cradle member 34 is also  
25 positioned forward of the duckbill valve 24 such  
26 that the dentifrice material is deposited along the  
27 length of the toothbrush head 44 from its distal end  
28 to its handle end. The maximum distance through  
29 which the toothbrush head 44 can pivot therefore  
30 corresponds to the length of a standard toothbrush  
31 head. Accordingly, the amount of dentifrice  
32 material dispensed from the duckbill valve 24 onto  
33 the toothbrush head 44 may be dictated by the degree

1 to which the cradle member 34 is pivoted and/or the  
2 incline of the contours of the cam surfaces 40.  
3  
4 It will be appreciated that the dispensing apparatus  
5 of the present invention can be easily disassembled  
6 for cleaning purposes or for replacement of parts.  
7 For example, the cradle member 34 may be  
8 disconnected from the casing 26 by manually pinching  
9 the sidewalls 38 toward each other thereby moving  
10 the protrusions 36 out of engagement from their  
11 corresponding apertures. Similarly, the rigid  
12 housing 18 can be removed from the casing 26 by  
13 sliding its projections 30 out of engagement with  
14 the corresponding grooves 32 formed in the sidewall  
15 of the casing 26.  
16  
17 It will also be appreciated by those skilled in the  
18 art that the apparatus of the present invention can  
19 be operated by only one hand and therefore provides  
20 a simple, effective and convenient means of  
21 dispensing dentifrice material onto a toothbrush.  
22 The features of the invention are particularly  
23 advantageous for children, the disabled or the  
24 elderly who may find conventional means of  
25 dispensing dentifrice material onto a toothbrush  
26 difficult to operate.  
27  
28 Modifications and improvements may be made to the  
29 above without departing from the scope of the  
30 present invention. For example, the dispenser need  
31 not be used exclusively for dentifrice material and  
32 could equally be adapted to dispense a variety of  
33 different semi-solids or fluids, for example,

1     creams, hand-wash, mousse, shaving gel, hair gel,  
2     washing up liquid and the like.

3

4     The conduit need not be in the form of a bellows  
5     pump and the volume varying means may act in a  
6     transverse rather than a longitudinal direction.

7     The cradle member may be adapted to correspond with  
8     the material being dispensed. For example, if  
9     material were intended to be dispensed onto a hand  
10    (i.e. soap or shaving foam) then an appropriately  
11    shaped cradle member would be employed.

12

13    Alternative one-way valves could be used at either  
14    end of the conduit and the collar could include a  
15    threaded aperture to receive a correspondingly  
16    threaded neck of a container.

17

18    The upstanding annular rings described above with  
19    reference to Fig. 3 could equally be incorporated  
20    into the other embodiments described with reference  
21    to Figs. 1 and 4b.

22

23    Whilst the dispensing apparatus of the present  
24    invention has been described as being fixed on a  
25    wall in a vertical orientation, it could equally be  
26    adapted to operate in other orientations.